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Lab 4, Milestone 2

Complete Code and Testing

Complete Code

After creating all the software design and test plans for the lab, we started designing the code and managed to complete all the required tasks from the lab manual as well as our Milestone 1 Specification. We managed to successfully design the code as our specification entailed, which is using the keypad to choose the waveform type that we wanted to generate.

- **Key 1 -** Sine Wave (variable amplitude, 83.3 Hz default frequency, variable LPF)
- **Key 2 -** Ramp Wave (variable amplitude, 62.5 Hz default frequency, variable LPF)
- **Key 3 -** Triangle Wave (variable amplitude, 83.3 Hz default frequency, variable LPF)
- **Key 4 -** Square Wave (variable amplitude, 500 Hz default frequency, no LPF)

After successfully designing the code to enter “Keypad-scanning mode,” we enabled the user to change the amplitude and frequency using the white potentiometer on the PCB board. We used the sample sine wave table for our signal and we created another ramp and triangle sample wave table. Then we set up our keystring and programmed in the “star” key to act as a terminating key and took the digit that was pressed before the “star” key to be a specific waveform. Most problems we ran into included frequency and amplitude adjustments, but we managed to calculate these numbers by creating an equation to calculate NVIC Systick values from the desired frequency and number of samples. We were then able to use the potentiometer to adjust these values by creating a variable “potRatio” which calculated the ratio of how far we turned the potentiometer into a useable percentage to be multiplied to NVIC values and amplitude values in order to control the amplitude and frequency, respectively.

The code “main.c” will be attached to the submission in PDF form for easy reading.

Fixes

However, there are still some fixes we have to make. First, we must enable the potentiometer to adjust the frequency from its lowest value (10Hz) to its highest value (10 KHz) as the potentiometer goes from 0x000 to 0xFFF. We plan to fix this issue by porting the AIN0 potentiometer-connected register values to port B temporarily, and seeing if the 12-bit value goes from 0x000 to 0xFFF when we turn the potentiometer to its minimum and maximum. Additionally, we will have to look at the math that we used for obtaining the frequency and NVIC value since our frequency was smaller than it should be. We will also need to change the LPFM value in our code to 0,1,2 or 3 from 4-7 after discovering that LPFM values of 4-7 correspond to the Low Pass Filter being off.